

In the claims:

1 1. (Original) A method making a magnetic head assembly that has an air
2 bearing surface (ABS) comprising the steps of:

3 making a read head comprising the steps of:

4 forming a read sensor;

5 forming a hard bias structure magnetically coupled to the read sensor for
6 longitudinally biasing the read sensor;

7 applying a first magnetic field to the hard bias structure for orienting magnetic spins
8 of the hard bias structure in a first direction that is parallel to said ABS and parallel to
9 major thin film planes of layers of the read sensor; and

10 applying a second magnetic field to the hard bias structure in a direction that is
11 antiparallel to said first direction.

1 2. (Currently Amended) ~~A method making a magnetic head assembly as claimed~~
2 ~~in claim 1~~ A method making a magnetic head assembly that has an air bearing surface (ABS)
3 comprising the steps of:

4 making a read head comprising the steps of:

5 forming a read sensor;

6 forming a hard bias structure magnetically coupled to the read sensor for
7 longitudinally biasing the read sensor;

8 applying a first magnetic field to the hard bias structure for orienting magnetic spins
9 of the hard bias structure in a first direction that is parallel to said ABS and parallel to
10 major thin film planes of layers of the read sensor;

11 applying a second magnetic field to the hard bias structure in a direction that is
12 antiparallel to said first direction; and

13 further applying one more additional magnetic fields parallel to the ABS and
14 parallel to major thin film planes of the layers of the sensor provided each additional
15 application of a magnetic field is oriented antiparallel to a previous application of a
16 magnetic field.

1 3. (Currently Amended) ~~A method making a magnetic head assembly as claimed~~
2 ~~in claim 1 including the steps of:~~ A method making a magnetic head assembly that has an air
3 bearing surface (ABS) comprising the steps of:

4 making a read head comprising the steps of:

5 forming a read sensor;

6 forming a hard bias structure magnetically coupled to the read sensor for
7 longitudinally biasing the read sensor;

8 applying a first magnetic field to the hard bias structure for orienting magnetic spins
9 of the hard bias structure in a first direction that is parallel to said ABS and parallel to
10 major thin film planes of layers of the read sensor;

11 applying a second magnetic field to the hard bias structure in a direction that is
12 antiparallel to said first direction; and

13 forming the magnetic head assembly as one magnetic head assembly of a plurality of
14 magnetic head assemblies in rows and columns on a wafer;

15 dicing the wafer into rows of magnetic head assemblies wherein one of the row of magnetic
16 head assemblies includes said one magnetic head assembly;

17 dicing the row of magnetic head assemblies into individual magnetic head assemblies where
18 one of the individual magnetic head assemblies is said one magnetic head assembly;
19 mounting said one magnetic head assembly on a head gimbal assembly (HGA); and
20 applying said first magnetic field to said wafer and then applying said second magnetic field
21 to said HGA.

1 4. (Original) A method making a magnetic head assembly as claimed in claim 3
2 further comprising the steps of:
3 mounting the HGA on a head stack assembly (HSA); and
4 mounting the HSA in a magnetic disk drive.

1 5. (Original) A method making a magnetic head assembly as claimed in claim 3
2 wherein a making of the read sensor includes the steps of:
3 forming a ferromagnetic pinned layer that has a magnetic moment;
4 forming an antiferromagnetic pinning layer exchange coupled to the pinned layer for
5 pinning the magnetic moment of the pinned layer perpendicular to the ABS;
6 forming a ferromagnetic free layer that has a magnetic moment that is oriented parallel to
7 the ABS and parallel to said major thin film planes of the sensor layers; and
8 forming a nonmagnetic spacer layer between the free layer and the pinned layer.

1 6. (Original) A method making a magnetic head assembly as claimed in claim 5
2 further comprising the steps of:
3 making a write head including the steps of:

4 forming ferromagnetic first and second pole piece layers in pole tip, yoke and back
5 gap regions wherein the yoke region is located between the pole tip and back gap regions;
6 forming a nonmagnetic electrically nonconductive write gap layer between the first
7 and second pole piece layers in the pole tip region;
8 forming an insulation stack with at least one coil layer embedded therein between
9 the first and second pole piece layers in the yoke region; and
10 connecting the first and pole piece layers at said back gap region.

1 7. (Original) A method making a magnetic head assembly as claimed in claim 6
2 wherein the step of forming said hard bias structure includes the step of forming first and second
3 hard bias layers adjacent first and second side surfaces of the sensor wherein the first and second
4 side surfaces are perpendicular to the ABS.

1 8. (Withdrawn) A method making a magnetic head assembly as claimed in claim
2 1 including the steps of:
3 forming the magnetic head assembly as one magnetic head assembly of a plurality of
4 magnetic head assemblies in rows and columns on a wafer; and
5 applying said first and second magnetic fields to said wafer;

1 9. (Withdrawn) A method making a magnetic head assembly as claimed in claim
2 1 including the steps of:
3 forming the magnetic head assembly as one magnetic head assembly of a plurality of
4 magnetic head assemblies in rows and columns on a wafer;

5 dicing the wafer into rows of magnetic head assemblies wherein one of the row magnetic
6 head assemblies includes said magnetic head assembly; and

7 applying said first magnetic field to said wafer and applying said second magnetic field to
8 said one row of magnetic head assemblies.

1 10. (Currently Amended) A method making a magnetic head assembly as claimed in
2 claim 1 wherein a making of the read sensor includes the steps of:

3 forming a ferromagnetic pinned layer that has a magnetic moment;

4 forming an antiferromagnetic pinning layer exchange coupled to the pinned layer for
5 pinning the magnetic moment of the pinned layer perpendicular to the ABS;

6 forming a ferromagnetic free layer that has a magnetic moment that is oriented parallel to
7 the ABS and parallel to said major thin film planes of the sensor layers; and

8 forming a nonmagnetic spacer layer between the free layer and the pinned layer;

9 ~~[[the]] making of the a write head includes~~ including the steps of:

10 forming ferromagnetic first and second pole piece layers in pole tip, yoke and back
11 gap regions wherein the yoke region is located between the pole tip and back gap regions;

12 forming a nonmagnetic electrically nonconductive write gap layer between the first
13 and second pole piece layers in the pole tip region;

14 forming an insulation stack with at least one coil layer embedded therein between
15 the first and second pole piece layers in the yoke region; and

16 connecting the first and pole piece layers at said back gap region; and

17 wherein the step of forming said hard bias structure includes the step of forming first and
18 second hard bias layers adjacent first and second side surfaces of the sensor wherein the first and
19 second side surfaces are perpendicular to the ABS.

1 11. (Currently Amended) A method making a magnetic head assembly as
2 claimed in claim 10 including the steps of:

3 forming the magnetic head assembly as one magnetic head assembly of a plurality of
4 magnetic head assemblies in rows and columns on a wafer;

5 dicing the wafer into rows of magnetic head assemblies wherein one of the row magnetic
6 head assemblies includes said one magnetic head assembly;

7 dicing the row of magnetic head assemblies into individual magnetic head assemblies where
8 one of the individual magnetic head assemblies is said one magnetic head assembly;

9 mounting said one magnetic head assembly on a head gimbal assembly (HGA); and

10 applying said first and second magnetic fields at any one of the wafer, row, individual or
11 HGA level of said one magnetic head assembly or applying the first magnetic field to any one of
12 the wafer, row, individual or HGA level of said one magnetic head assembly and the second
13 magnetic field to any other one of the wafer, row, individual or HGA level of said one magnetic
14 head assembly.

1 12. (Original) A method making a magnetic head assembly as claimed in claim 11
2 further comprising the steps of:

3 mounting the HGA on a head stack assembly (HSA); and

4 mounting the HSA in a magnetic disk drive.

1 13. (Original) A method making a magnetic head assembly as claimed in claim 12
2 further applying one more additional magnetic fields parallel to the ABS and parallel to major thin
3 film planes of the layers of the sensor provided each additional application of a magnetic field is
4 oriented antiparallel to a previous application of a magnetic field.